HOW INTERDISCIPLINARY IS *INTERDISCIPLINARITY*?

Revisiting the Impact of aDNA Research for the Archaeology of Human Remains

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With this paper I propose a reflection on the way interdisciplinarity is framed in reference to the study of archaeological human remains. It is often taken for granted that interdisciplinarity is valuable for archaeology – but why should it be? By taking the case study of the way ancient genomics research is rewriting the 'Neolithic Revolution' narratives I show how the use of scientific methodologies influences and biases the kind of work that gets done and the questions that are asked.

Key words: interdisciplinarity, DNA, archaeology, method, narrative

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> The problem is that evaluation is now led by the data rather than by judgement. Metrics have proliferated: usually well intentioned, not always well informed, often ill applied. (Nature.com)

Arlette Farge (2013 [1989]) wrote in *The Allure of the Archives* how, once researchers find themselves in the midst of the archives they are overwhelmed by the illusion that here one is in immediate contact with the voices and witnesses of the past; if they listen carefully, then reality, as it was, will emerge from the pages. However, the historian soon understands that, unfortunately, this is not the case, as this 'space of captured speech' (2013:79) is forever incomplete, so the stories within need to be tied to a bigger narrative if they are to gain meaning. Her account is wonderfully pertinent to the work of archaeologists who are often caught in the same illusion as the historian in the archive: that by applying the correct and sufficient methods, the past will reveal itself. This aspect becomes especially relevant in light of new 'interdisciplinary' trends whose results appear self-evidently objective and in no need of a further narrative. Instead, it is important to understand just what interdisciplinarity can do to solve methodological challenges for archaeology.

Given the fragmentary nature of the material record, archaeologists are ever-expanding their intellectual and methodological tool-box, going beyond the disciplinary boundaries, and involving themselves in what are often called interdisciplinary projects. Alison Wylie and Robert Chapman (2016:15) raise in their latest book the interesting point that this phenomenon is closely tied to an 'epistemic anxiety' inherent to archaeological reasoning, namely the fear that there is only so much we can learn about the past, especially if this knowledge is to be 'objective'. I would claim that in archaeology we now see a structuring of discourses around interdisciplinarity as a way of framing relevance and innovation in the face of the 'manifold and messy' problems of life and society, to quote Frickel and colleagues (2017) (and also as a result of external pressures from funding bodies).[1] This interdisciplinarity seems though

1 The 2000s have seen the appearance of new 'interdisciplinary' programmes and institutions: the UCLA Institute for Society and Genetics, the Max Planck Institute for the Science of Human History (Jena), the Leverhulme Centre for Human Evolutionary Studies (Cambridge), not to mention that 'interdisciplinarity' is an omnipresent requirement in most grants/fellowships (certainly for the EU funded ones), and after the Post-Processualist fashion of the 1990s and early 2000s, employing multiple humanist disciplines to answer a research question is not usually considered sufficient interdisciplinarity in archaeology any more. A series of recently organized events at major international archaeological conferences also indicate the existence of such concerns (CE TAG 2017, EAA 2017 has six sessions and a dedicated key-note lecture), though the perspectives on where to take these trends varies between authors.

to incline more and more towards the natural and hard sciences, as a way of grounding the discipline, and of delivering measurable and seemingly objective facts. 'DNA secrets of Ice Age Europe unlocked' (BBC.com), 'DNA Analysis Shows Modern Europeans Descended From Belgians' (Scienceworldreport.com), 'Ancient DNA solves mystery of the Canaanites, reveals the biblical people's fate' (Washingtonpost.com) are only a handful of recent titles of research-turned media headlines, texts in which DNA, isotopes, and carbon dating appear alongside phrases such as rewriting history, new light on the past, or complexity. We are witnessing a writing of narratives on past lifeways in scientific terms, with the methods employed presented as being more rigorous than traditional archaeological methods; as Julian Thomas (2015:11) points out, they 'are now able to answer archaeological questions that were hitherto metaphysical'. However, archaeologists tend to operate under the illusion that bringing together data generated inside these various disciplines and paradigms is unproblematic (see also Bickle & Whittle 2013:15), but important epistemological concerns are raised when, for example, archaeology draws genetic or biological data into cultural narratives. This is important especially when it comes to the study of human remains, and it raises ethical concerns, because it is one thing to focus on 'objectively' reading the traces of past agencies inscribed on biological bodies (see Ion 2016), and quite a different thing to talk about individuals with agency, living in a specific context. Furthermore, as the examples above illustrate, such narratives are prone to be picked up by media, and they are easy targets for political agendas (in a large understanding of the term), which invites us to be cautious.

Thus, in this article I will tackle three problems: (1) that this multidisciplinary data, especially the data resulting from 'hard' sciences, is not integrated successfully with historical and cultural contexts (and thus falls short in accounting for the historicity of the traces of the past)[2] that (2) these new datasets bias archaeologists to focus on particular questions and (big) scales of analysis, and that (3) this raises the question of what a truly integrative narrative would look like. To reflect on these issues, I will first discuss a high-profile example, the analysis of Richard III's remains, and then move to a more substantial case study, that of ancient genomic research into the 'Neolithic Revolution'. Finally, I will conclude by highlighting the particular voice that archaeology can have in establishing itself as a strong interdisciplinary endeavour. Ulti-

2 After this text was submitted, two other papers were published tackling a similar question, though partly in a different way: Furholt 2017 and Sørensen 2017. For this reason, I could not engage with their arguments for the purpose of this text.

mately, this is not an exercise whose aim is to annul the efforts of (osteo) archaeologists, scientists, and mortuary practitioners. Rather, by taking a critical approach towards the way in which the body is understood in interdisciplinary projects, it is my intention to highlight the concept of *value* (why do we find these methods valuable to us?). And I think that precisely the belief that these methods provide better answers to old archaeological questions deserves investigation.

Lastly, it is not the goal of this text to reiterate the well-known 'Two Cultures' divide (Snow 1959)– a debate which proved useful at the time, but which is less helpful now to take the debate further. Rather, my specific aim is to reflect on the implications of the ways in which genetic data is brought together with archaeological data, and on how the weight given to scientific arguments has shifted (and from an annex they take the lead). Though I believe that a strong interdisciplinary framework aimed at understanding the archaeological record needs questions derived from the humanities, nevertheless I also think that scientific data brings an important contribution, given that humans are the result of contingent histories of genetic, biologic, environmental, and cultural interactions, but moving between scales of analysis is where the true challenge arises, something which will become apparent through the case studies discussed.

INTERDISCIPLINARITY, (OSTEO)ARCHAEOLOGY AND THE IMPACT OF 'HARD' SCIENCES

'Interdisciplinarity, in short, has no inherent meaning' as Julie Thomson Klein (2005:63) rightly points out. Currently, there is quite a broad literature showcasing the importance of interdisciplinary data in archaeology (see studies in Killick 2005; Pollard & Bray 2007; Killick & Goldberg 2009; Bickle & Whittle 2013; Martinón-Torres & Killick 2015; Samida & Feuchter 2016; Kluiving *et al.* 2017; and in reference to the study of human remains see the analysis of Nilsson Stutz 2016); however, most of these texts do not delve into the challenges of defining what the concept means for our discipline, the epistemological implications or ontological assumptions. Beyond the enthusiasm for so many available tools and methods, what is the fundamental question that such research is trying to answer, and does interdisciplinarity really help us get there? A look at the specialized literature (e.g. Klein 1990, 2010; Moran 2002; Frodeman *et al.* 2017) reveals that the concept is directly linked to what might be called the 'specialization of difference' (Klein 2005:39). Interdisciplinarity has been put forward as an integra-

tive framework for data coming from various directions, with the goal of obtaining a unity of knowledge, but also as a particular way of localized problem solving, to address the challenges of certain situations (see a more elaborate discussion in Klein 2005:31). In archaeology, its meaning has referred to both of these dimensions, and Gavin Lucas (2015) links this tension between top-down and bottom-up theorizing with a whole set of oppositions between empirical and interpretative focus, deductive and inductive reasoning.

But in order to start the investigation into what this means for contemporary archaeology, we need to set some signposts along the way. This is especially important in the context of a breaking down of a unitary approach as Kristian Kristiansen (2014) would say, multiple archaeologies seeming to coexist (see also Lucas 2015:13), which makes difficult to pinpoint a clear-cut set of standard, agreed-upon norms in archaeology. Therefore, the three interrelated issues which structure this discussion are: (a) archaeology has been borrowing methods from other disciplines in order to address the fragmentary nature of the record, but (b) nowadays these methods seem to lean more towards the 'objective' disciplines. This in turn has (c) an effect on the kinds of questions which archaeologists ask, picking questions which have 'impact' – in terms of both academic publications and media attention.

In its quest to go beyond the limitations of the archaeological record, archaeology has taken from the start a pragmatic approach, borrowing tools from other disciplines – both intellectual and practical – from the stratigraphic concept in early 19th-century geology, typological ordering of materials taken from the natural sciences, to evolutionary theory, or ethnographical analogy. These methods and concepts have become embedded in the archaeological episteme: they are generally accepted and are rarely viewed as interdisciplinary endeavours; they are constitutive of the way in which the discipline was created. Gavin Lucas (2015:15) thinks that their borrowing has not been a mechanical act, simply copy-pasting them into archaeological frameworks, but rather 'we have also made [them] our own, exploited [their] affordances and developed a very different set of techniques' based on them.

Nowadays we are witnessing a growing interest in combining datasets coming from the 'hard' sciences, which Kristian Kristiansen (2014) labelled as the Third Science Revolution in archaeology. Along the same lines, Marcos Martinón-Torres and David Killick claimed in their 2015 (1) article that they think: 'Archaeological science is central to contemporary archaeological theory and practice, and will become increasingly important in the foreseeable future', and indeed this seems to be the case (see also Torrence *et al.* 2015; Wylie 2017). But with the application and

refining of the new scientific methods we are also witnessing a change of focus and scale of archaeological topics: genetic data and statistical modelling determined a renewed interest in the migrations and history of the human species, chemical elements analyses (strontium, isotopes) have allowed the study of diet, geographical sources, and 'long space exchange' (see also Killick 2015), and at the same time radiocarbon dating and other scientific techniques have been used to refute old assumptions. Parallel to trends in other disciplines, the use of such methods and technologies seems to have led to a growing focus on Big Data analysis, bringing in turn a change in the scale of analysis. For example, if one picks ancient DNA data, such data works at a macro-level of analysis – group/population, larger time frames – and hence the research hypothesis will inherently follow the same scale of analysis.

A relevant case where we start seeing the impact of these new scientific techniques in stirring archaeological projects is the frenzy to unearth medieval kings' bodies in order to fix their identity (see a critical discussion in Ion 2017, also Toon & Stone 2017). In the much publicized case of the unearthing of the supposed remains of Richard III, multiple researchers' expertise has been mobilized to obtain different kinds of data, from osteological to DNA and archaeological, all with the result of focusing on a question which is not actually a traditional archaeological one: who is X body? Why did the research, as suggested by the project's page (https://www.le.ac.uk/richardiii/), and the results presented in the media, focus so much on attaching a name to the body, as a goal of research, very similar to a forensic investigation, when the published data told a somehow different story (theoretically this was an investigation of the former monastery grounds, see Buckley *et al.* 2013)? As Mary Beard pointed out: 'Gt fun & a mystery solved that we've found Richard 3. But does it have any HISTORICAL significance?' (Guardian.com/science), while Charlotte Higgins, chief culture writer of the *Guardian* emphasized (Guardian.com/culture):

> I'm not saying it's not good fun, and indeed mildly interesting, that the remains of the last Plantagenet king have apparently been found. […] I'm just suggesting that it's rather a limited avenue of historical research that seems to have much to do with the dread word 'impact' […] than with pursuing a genuinely intellectual field of enquiry.

What happened in this case is that, by placing at the centre of the investigation the scientific analyses of the materiality of the body (genetics, pathology etc.), their focus shifted from a historical investigation to an endeavour that put a face to an already known story. It should also be mentioned that what can be noticed when looking at how data has been

prioritized in press conferences and elsewhere, the molecular evidence was favoured against historical interpretation, and DNA being picked as the nail in the coffin of the interpretation, the piece of evidence which proved without a doubt the identity of the person in question. This trend is however part of a wider cultural phenomenon which transcends the academic arena, a true 'DNA mystique' (Nelkin & Lindee 2004). Stable, reliable, and definite answers have always been preferred to relative positions by the wider public as well, and I think we undergo times when the academic realm and the public's voices influence each other.

However, even though some might assume that these issues are confined to such high-profile projects, and are mostly due to media's reading of research results, I would say that this example brings to the fore a more complex problem which affects the way archaeologists negotiate relationships between different kinds of evidence. And the Richard III case is just the tip of the iceberg. As we have seen above, archaeology has traditionally employed results from other disciplines in order to help it raise its interpretative scaffold: these were bits of evidence used as supporting arguments, helping in building a case for its leading question. But what seems to be happening now is that one (or several) of these bricks – the scientific datasets – takes centre stage and modifies the blueprint and the hypothesis. The allure of these 'bricks' resides in their apparent intrinsic objectivity, and universality, as an illuminating line from the genetic report on Richard III states: 'Further genetic research will not change these conclusions' (Buckley *et al.* 2013:536). In reality, what constitutes a fact depends on the agreed norms in a discipline at any one time, and in order to gain archaeological meaning, it needs to be tied in with a meaningful question. Otherwise, employing scientific techniques might not even respond to relevant research questions. But to what extent is this biasing of research questions happening?

CASE STUDY: THE WAY ANCIENT GENOMICS RESEARCH IS REWRITING THE 'NEOLITHIC REVOLUTION' NARRATIVES

So, let us move forward and evaluate more closely this apparent superiority of evidence coming from natural sciences, and observe how new evidential claims are taking the lead in the investigation by looking at the effect of ancient genomics research on the 'Neolithic Revolution' narratives. In what follows I will look at how the old archaeological question of Neolithization is tackled through new scientific methods, the problems raised by these, and the kind of body that such narratives imagine.

The transition to a Neolithic way of life, with all that it brought to the history of human civilization, has always captured the interest and imagination of archaeologists since the early days of the discipline (for some recent studies see Bickle & Whittle 2011; Manen *et al.* 2014; Reingruber *et al.* 2017). The roots of this concept are to be found within the cultural-historical model, as proposed by Gustav Kossina (1911), followed by Gordon Childe (1925), where migration was used as an explanatory device accounting for cultural change (Hackenbeck 2008), and not a topic of interest in itself. The introduction of physical anthropological methods in archaeology, and the aim of establishing racial and population types allowed for a use of skeletons as diagnostic markers of archaeological cultures. With the works of A. J. Ammerman and L. L. Cavalli-Sforza, and their proposed wave-of-advance model (1984) genetic methods were introduced in archaeology in the study of the transition to a Neolithic way of life. In this way, the focus shifted 'from phenotypes to genotypes, from cranial characteristics to classic genetic markers, from races to populations' in the words of Mihael Budja (2013:45). After the Post-Processualist years, when narratives seemed to focus more on smaller-scale cases and on individual agency, the last couple of years have been marked by a rise in numbers of articles tackling the Neolithic Revolution by applying ancient genomics analysis. The fact that these are published in high-impact journals such as *Nature* and *PlosOne* tells us about the need of the scientific community to obtain some answers to a century-old debate: how did the process of Neolithization happen, what brought it about, and how did it spread? However, even though some of the parameters of the old debates changed, in essence migrations are still being used as explanatory devices, and they are not studied as complex anthropological, biological and technological events. The introduction of aDNA techniques also brought the human remains to the fore: they take on the importance of historical sources, and hence their materiality holds clues to the past.

The old debate about demic versus cultural diffusion of ideas is tackled through an investigation of ancient human genomes, which is then compared to other ancient populations or modern samples (e.g. Fu *et al.* 2012; Fernández *et al.* 2014; Omrak *et al.* 2016). These new projects are often trans-border projects, comprising large teams, and they tend to link the generated data to big narratives: such analyses span a wide geographic area, and they usually cover a long timescale, e.g. studies looking at 'Linearbandkeramik populations' comprised individuals over 600 years (Haak *et al.* 2010), another study looked at 1900 years of Pre-Pottery Neolithic B populations (Fernández *et al.* 2014), while a study on South East Europe covered five and a half millennia (Hervella

et al. 2015). This kind of approach is on the rise; after 2005 one sees a major leap in numbers, and their number keeps growing yearly. Though one might argue these are just genetic articles and not interdisciplinary per se, they normally have archaeologists as co-authors, and employ a range of archaeological information, from contextual data to dating, not to mention that their results are presented as settling this old archaeological question.

Furthermore, these scientific methods tend to prove seductive; as the case of Richard III demonstrated, and they seem to become a staple, a method to be followed by other archaeological projects. It is hard to imagine a project which integrates the study of Neolithic human remains in its analysis and does not apply genetic methods (or plans to in the future), while a look at the current and past ERC-funded archaeology projects shows that in 17 out of 57 projects (29.8%) genetic data is explicitly part of the interpretative framework (and in 15 of them it is isotopes). Also, sitting through talks on the interpretation of human remains from prehistoric settlements (from Anatolia to the UK) during the past year revealed a generalized hope of researchers that aDNA studies might shed some light on the otherwise puzzling selection of individuals, and thus take the interpretation out of the impasse it is now facing. Thus, such studies are undeniably having an impact on archaeological reasoning, and for these motives I think one needs to take a closer look at the assumptions which structure such endeavours.

In short these projects assumptions are that:

- the Neolithic transition to agricultural ways of life in Europe is a process with an important demographic impact (often placed in the same line with the migration of *Homo sapiens sapiens* into Europe and the Bronze Age migrations);
- that broadly speaking the study of aDNA material can shed essential light on understanding the Neolithization process in Europe.

For example, in the important recent study focused on the Balkan Neolithic (one of the hypothesized gateways through which the Neolithic spread into Europe) by Hervella and colleagues (2015) the researchers set out to: analyse aDNA seen as (1) 'an important source of information to assess the process of Neolithization in Europe', to (2) 'shed light on the genetics of the different waves of migration of Neolithic and Bronze Age populations penetrating Europe from Anatolia and the steppes north of the Black Sea', and to (3) 'assess the genetic impact of prehistoric events in the genetic composition of the present-day European populations'. In order to achieve this, they sequenced the mtDNA of 80 teeth from 63 skeletons originating from 10 archaeological sites from contemporary

Romania, *c.* 6300–1100 cal BC (Hervella *et al.* 2015). The analysis was broken down following the broad archaeological chronology: Early Neolithic to the Late Bronze Age. Eleven human remains were ^{14}C-dated, and one was proven to fall outside the time interval; this relates to the study of Lazăr and colleagues (2013:76) where two out of six dated individuals fell outside the assumed Neolithic time frame. Finally, based on the identified haplogroups, the authors established the genetic relationship between Early Neolithic farmers of the Starčevo Criş and Linienbandkeramik culture (LBK), 'little genetic continuity with modern European populations', and highlighted the more important effect on the 'genetic heritage of the European populations' played by a second wave of migration during the Middle Neolithic (Hervella *et al.* 2015). The second and third goals of this study partly fall outside the aim of this analysis; if one is interested in the dispersal of certain genetic makeups this can be a valid approach, and the genetic diversity of these populations can be a useful question for geneticists. But for archaeologists it is not very interesting, or better said not in the way it is interpreted, as this should be the start of an interpretative inquiry, and not the end result; it is just data in want of a narrative. More importantly, the assumption lying behind the first aim of the paper – that aDNA results in themselves can shed light on Neolithization – opens them to critical archaeological inquiry given that this part of the analysis aims at addressing a traditional archaeological question. It should be noted that this hypothesis is in no way unique to this study; rather it seems to be a staple of such projects: 'Whether it was mediated by incoming farmers or driven by the transmission of innovative ideas and techniques remains a subject of continuing debate in archaeology, anthropology, and human population genetics,' write Haak *et al.* (2010) for example. And Fu *et al.* (2012) claim:

> Short stretches of ancient mitochondrial DNA (mtDNA) from skeletons of pre-Neolithic hunter-gatherers as well as early Neolithic farmers support the demic diffusion model where a migration of early farmers from the Near East and a replacement of pre-Neolithic hunter-gatherers are largely responsible for cultural innovation and changes in subsistence strategies during the Neolithic revolution in Europe.

How successful, then, is this model for understanding past historical processes? There are several immediate concerns regarding the way in which genetics data relates to the archaeological evidence, an aspect which has come under critique in the past as well (e.g. Anthony 1990; Chapman & Dolukhanov 1992; Zvelebil 2000; Pluciennik 2006; Mark Zvelebil was one among several who challenged the wave-of-advance model, and proposed seven other models of change). The criticisms

are: (1) methodological, regarding the sample size, and the relationship between hypothesis and the applied method, and (2) epistemological: they are reductionist in terms of interpretation potential, and they also limit the understanding of human beings to genetic entities. So let's take them in turn.

The methodological points which open these approaches to a critical inquiry are: the small sample size (in best cases a dozen individuals spanning quite long time intervals); the terms of comparison are not always equal among themselves (in some cases aDNA is compared with aDNA, and in other cases with modern DNA samples, and in even more confusing situations both time horizons are involved, not to mention that in many areas there is very limited genetic data on the Mesolithic population); statistical choices are made when modelling population affinities – and by virtue of being a choice they are open to alternatives. As important are the implications which come with the use of statistical models, designed through the use of binary logic in order to explain the distribution of aDNA data. These, unfortunately, do not leave too much room for alternative models (e.g. testing either demic diffusion or cultural adoption; see also Pluciennik 2006).

When it comes to the epistemological concerns, most of the above mentioned projects' assumptions have been well addressed by Heyd (2017) in a recent article appropriately entitled 'Kossina's smile', where he clearly shows how this approach brings nothing new in terms of a conceptual understanding of the Neolithic process: in a Gustav Kossina (1911) type of account, material cultures are tied to ethnicity and things believed to change due to an external input of population (a classic early 20th-century diffusionist model). In such accounts, cultural transmission is usually opposed to genetic input, and the new kinds of analysis are the ones meant to settle the debate. In trying to see if the Neolithic 'tool-kit' (dwellings, agriculture, pottery) was brought over by certain people, the 'Neolithic' man (may s/he be from the Starcevo-Cris, Dimini, or Gumelnita culture) is sampled for DNA, and then compared with other 'Neolithic' individuals from some other places/cultures. This situation is puzzling because even though 'archaeological cultures' are generally understood as being mere conventions, inherited from a time when academics thought that a certain ethnicity was tied with a certain material culture, in such analysis they become the basis of analysis. At the same time, what do we mean by saying that new settlers brought the 'Neolithic revolution/package'? For the Balkan area, for example, several studies have questioned how sedentary some of these Neolithic communities were, while ceramic traditions are also associated with 'local' hunter-gatherers throughout Eurasia (see Budja 2013).

Therefore, the important question is to what extent can aDNA evidence, ^{14}C dates, and archaeological evidence be mapped one onto another? How can we successfully move between scales when devising such multidisciplinary models? Ultimately, how can we move beyond 'simple dots and arrows' on a map – a universalist and normative understanding of historical processes (see also Hackenbeck 2008:18) – and explain what migration and/or change entail?

Operating with a distinction between cultural transmission and genetic input, even though some authors take a more nuanced approach, is reductionist. Not only is the wide scale of analysed space problematic – the Balkans, Central Europe, Anatolia-, but more importantly this does not try to understand what Neolithization means, what changes were brought in, the new ways of working through the environment (see Barrett 2014), and the adaptations it required. By simply saying that people moved one does not get closer to the matter. From historical and social theory investigations we have gained a deeper understanding of migrations and the various forms they can take, as the new arrivals have different impact and genetic input: e.g. in the US the white British settlers had a different impact than the Italian and Mexican immigrant waves in respect to material culture, institutional or political configurations; the migrations of the Bulgarians or Normans during the Middle Ages had an important political impact, though less so at a demographic level. Genetic data alone cannot tell a specific narrative, that is to say, the *whys* and *ways* in which things happened, and such analyses are certainly not interdisciplinary in their structuring. As Agathe Reingruber and colleagues (2017) rightly point out in the introduction to their recent volume, when looking at the Balkan area, 'if one is to understand the complex process at work they need to understand the interplay of various factors and ways of life' (the impact of hunters, foragers and fishers, and to take into account the multidirectional nature of exchanges).

The problem with this route also has an important ontological consequence, as viewing the body as a biological entity, decoded in terms of genes, is a model which frames identity in genetic determinism, instead of one placing human agency at the core of its interpretation. For a humanities or social sciences perspective the interpretation of the body goes beyond, as what is interesting to see is how one responds to external and cultural factors, how such events shape identity and how this is represented in the face of new changes. Identity is a concept with different meanings for archaeology and genetics: while for the former the interesting question might be 'who did [these people] think they were?' to quote Daniela Hoffman (2015:460), genetics works at popu-

lation history level, with changes over long periods of time which might have taken very different cultural readings at the time. Thus, on the one hand we have a discourse focused on populations, big data, modelling movement – what people 'might have done', and another type focused on localized refined case studies, smaller scale of focus, and where the body is an integral part of a wider package. Both ends of the spectrum can be interesting in their own right, depending on what question one is trying to answer, but trying to combine them in order to create truly novel and interesting interdisciplinary research presupposes the need for a strong interpretative framework that would allow one to move from the particular to the general, and to link the parameters in a meaningful way. When genetic data is seen as a (better) answer to old archaeological questions, what is actually happening is that genetics claims to settle a debate which has been framed in a different kind of interpretative framework and using specific concepts: archaeological culture, cultural periodization (Neolithic, Bronze Age etc.), material culture in order to make sense of its results. Thus, the archaeological concept of culture gets translated to ethnic identities (individuals tested are identified based on their cultural identity and proximal affinity), which are then analysed through genetic methods, ultimately interpreted in terms of cultural processes.

Ultimately, these concerns are bound to appear given that interdisciplinarity is not a process of spontaneous generation (see Klein 1990:116) resulting from putting together archaeologists, geneticists and others. Rather, this should be understood as a synthetic process, in which 'individuals must work to overcome problems created by differences in disciplinary language and world-view' (Klein 1990:188). Surprisingly though, it seems that precisely this complex process of negotiation and of finding a 'meta-language' is almost absent at present.

ARCHAEOLOGICAL SCIENCE VERSUS SCIENTIFIC ARCHAEOLOGY

After we have seen how the new methods of aDNA research limit the interpretation of the processes discussed, we are left with the question: is this the only way in which the relationship between natural/hard-science evidence can be framed in archaeology? Concerns about the limiting effect of scientific methods in archaeology have always been present, especially when it comes to the study of human remains; Liv Nilsson Stutz sees the geneticists' work as 'mining burials for material may also cause ethical challenge' (2016:25), Alison Klevnas

points out that 'populations' are not 'convincingly defined' (2016:53), while others highlight how the scientific analyses of the body sometimes take 'an alarmingly deterministic turn' (Gowland & Thomson 2013:13). This is part of the wider debates on the disciplinary divide between osteology and funerary archaeology (see Joana Sofaer's work), or more recently burial archaeology versus the archaeology of death (Nilsson Stutz 2016). These ultimately relate to the half-century debate about the division of the Two Cultures, humanistic versus scientific approaches.

However, I propose that we think of these issues from a different angle: trying to tackle these divisions will always prove problematic given that archaeology has always been riddled with hard/natural-science data on some level or another. So in fact the question is: what value do we want to ascribe to scientific data? To answer the question, I think we need to start from a useful distinction made by Marcos Martinón-Torres and David Killick (2015) between archaeological science and scientific archaeology, and then look at the lessons that the history of archaeology can teach us in that respect, especially the Processualist experiments.

The term archaeological science refers to the borrowing of scientific methods in archaeology, while scientific archaeology has a more epistemological bearing, as it implies equating archaeological interpretation with the interpretative frameworks of the natural sciences: 'the conviction that archaeology should model its methods of inquiry and inference upon those of the natural sciences' (Martinón-Torres & Killick 2015:2). I would claim that what we are currently witnessing is a move from the first to the second category: projects in which DNA, isotopes etc. are not merely an annex of the text, but bring/model the kind of questions asked, e.g. establishing genetic lineages, dispersal models, or diets are not mere means to an end, but they become the main topic of the analysis, and the body is fixed as a biological entity. While archaeology has always involved some kind of the first relationship (at least when it comes to imagining its field methods, its stratigraphic outlook and so on), the first time in the history of the discipline when it leant towards a scientific archaeology was with the New Archaeology of Lewis Binford. Under the influence of philosophers such as Ernest Nagel, Rudolf Carnap, Carl Hempel and Karl Popper, the neopositivist aims of this paradigm were in search of a scientific and 'complex' perspective to integrate the material remains of the past. Binford opposed the view that the archaeological record is limited with respect to the kind of information it can yield, and he proposed that, in contrast, the record should be imagined as the result of past dynamics:

> The archaeological record is at best a static pattern of associations and covariations among things distributed in space. Giving meaning to these contemporary patterns is dependent upon an understanding of the processes which operated to bring such patterning into existence. […] One cannot easily obtain such knowledge and understanding from the study of the archaeological remains themselves. (Binford 1980)

He proposed a method based on model building and hypothesis testing, grouped under the name of middle-range theory, a hypothetical-deductive model (according to Bell 1994:125) or rather probabilistic-statistic (Spaulding 1968:36), one that could be a bridge between data and cultural processes. This echoed Charles Hempel's proposed methodology for historical investigation of 'establishing universals by confirmation' (Bell 1994:125), supporting a scientific approach to a narrative one. Thus, the New Archaeology raised a couple of inter-connected points: a re-evaluation of what the material remains stand for (not the past, but a record of past dynamic relationships), how this should be decoded (in a scientific way, by building inferences between data and theory), and a systemic view of the record, a look for universal models to explain particular configurations. In relation to our discussion here, and the role of science in archaeology, it did two things: it saw anthropology (archaeology) as a science, sharing many types of explanation patterns with hard sciences, and it also led to the appearance/multiplication of the use of sciences in archaeology: from statistics to osteology, archaeozoology, geology etc. Even so, these observations were subsumed in a wider archaeological interpretative framework and question: 'how and why such systems change' – changes in landscape, climate, materials – were linked to an internal functionalist logic, all trying to model human interaction in an ecological environment.

Binford wrote this in his seminal paper 'Archaeology as Anthropology' (1962):

> If migrations can be shown to have taken place, then this explication presents an explanatory problem; what adaptive circumstances, evolutionary processes, induced the migration (Thompson 1958:l)? We must seek explanation in systemic terms for classes of historical events such as migrations.

And here we see how he stresses the importance of explanation versus explication, with migrations and other topics being classified as classes of historical events, which need an explication in a 'systemic term'. Of course, how one understands the system, the relationship between structure/parts/links might vary. These approaches were later criticized by the proponents of the Post-Processualism approaches, claiming that the

search for universals hindered an investigation of human agency. While I agree with this critique, I would say that the New Archaeology philosophy was right in one respect: reading the material traces as past dynamics which need a broader explanation (going beyond a simple class of event).

Therefore, the question is how to integrate these new data in order to go beyond the limitations of Processualism (mostly the absence of individual agency in driving change), to use the potential of the new genetic and other scientific results, but in a meaningful way for an archaeological narrative.

ARCHAEOLOGY AS STORY-TELLING

So far we have seen that (1) a certain epistemic anxiety leads archaeologists to (2) turn towards scientific methodologies in order to write more reliable narratives, but this (3) raises several issues, most importantly the problem of integrating them in historical narratives. While I mean in no way to dismiss the value of scientific methods for archaeology, or imply that all interdisciplinary projects follow this pattern, my claim in this article has simply been that usually what is deemed interdisciplinarity research is nothing but collaborative multidisciplinary problem-solving approaches, where the research agenda is driven by one of the datasets involved; also that these new scientific datasets should not be seen as the Holy Grail we have been searching for, the answers to our old questions, because at the moment their interpretation and integration seem to be problematic. Data is good as long as it is useful to us, but not when the methodology becomes unquestionable dogma or the goal of research. We should think more of how this integration should take place, otherwise we end up with a Frankenstein type of approach, where disparate parts are brought together in an attempt to make them fit. Thus, how do we solve the problem of integrating various kinds of materials?

At present I think there is no clear answer to this, but a way forward might be to see archaeology as a powerful kind of story-telling, focusing on the weaving of narratives that can link the particular with the general in an integrative framework, thus providing explanation and tackling the historicity of processes in their complexity. In the dedicated latest issue of *Studies in the History and Philosophy of Science A*, philosophers of science show how the narrative is a powerful kind of explanation, as it can situate evidence, and highlight causal links (Morgan 2017; Morgan & Wise 2017). Though it can be speculative, it

can also 'aid in overcoming local underdetermination by forming scaffolds from which new evidence becomes relevant' (Currie & Sterelny 2017). Archaeology deals with large time frames and spaces and in this way narratives can link the particular with the general in an integrative framework, to track changes and understand how they came about. In this way, disparate elements are not only given coherence and are related one to the other, but they are also constitutive of a theory of sociality. And when we imagine such a narrative, we can bear in mind the words of Tim Ingold (1990:221):

> If social life presumes the existence of persons, then clearly any account of social evolution must start out from a theory of how persons are possible. In other words we require a theory of sociality. By sociality I refer to the generative properties of the relational field within which persons are situated.

Genetic, isotopic, or dating results have no intrinsic meaning; they are useful elements when they are interpreted in a historical and/or anthropological key, and when for example migrations, settlements, typologies and resources choices are seen as the results of certain kinds of sociality, ways of becoming human throughout the centuries and millennia. In this weaving of narratives an interesting inspiration can be found in the field of historical theory, which has a tradition of questioning how to deal with combining multiple sources of evidence. Instead of attempting to make archaeology more objective and science-like, taking it towards mathematical models, we should embrace exactly what made it strong and a source of inspiration for decades: its contextual, and genealogical reasoning approach. What others pick up about archaeology as its strength, from Foucault to psychoanalysis, from digital humanities terminology to the public's imagination, is its ability to construct a narrative by grounding material traces.

We should aim at thinking of humans' past and of their possible worlds as the historian Carlo Ginzburg would have stressed. In this regard, he also highlights the specificity of the historical representation (Ginzburg 2012:58):

> At this point the divergent perspectives of the judge and the historian seem clear. For the former, the margin of uncertainty had a purely negative significance and might have resulted in a non liquet, or, in modern terms, a dismissal for lack of evidence. For the latter, it sparked further investigation, to link the specific case to the context, here understood as the realm of historically determined possibilities. […] 'True,' 'probably,' 'proofs,' and 'possibilities' are interwoven, while at the same time remaining rigorously distinct.

What is ultimately at stake is how we choose to frame humanity and individuals through our narratives. Human remains when they become subjects of multidisciplinary analysis, are framed as a particular kind of sign in relation to the past; their materiality (the biologic makeup) is seen as a way of inferring historical processes (such as migrations and movement, health and lifestyles). Their dual state – once living beings, and now part of the natural realm – makes them what Marko Marila (2012), inspired by the French philosopher Michel Serres, calls quasi-things, not fully subjects, but not truly objects either. At present, these projects seem to target the material dimension of the remains, what ties them to this natural realm. Even though scientific methods are seen as a more reliable way of writing a narrative on the past as they seemingly provide more comprehensive and objective evidence – measurable, testable, and reproducible, in reality they fail to account for the alterity of the material record, and of the human beings. Therefore, we should make use of such scientific data, but we need to turn the collaborative projects on their head: to devote our energy to building relations and to defining the 'generative properties' of the systems we encounter. In this way one can truly start on the way towards an interdisciplinary approach, and in building a strong case for the value of archaeology in 21st-century science and society.

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